

APFO Ground Control Point Status 2011

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2011 USDA Imagery Planning Meeting

Outline

- Review
- Purpose and Use
- Current Status
- Future Plans

Once upon a time ...

- Began creating NAIP GCP database in 2006
 - GCPs not used initially for NAIP because no nationwide, photo-identifiable, standardized database was available.
 - Relative control (comparing to existing imagery) worked well for checking large amounts of imagery in a short amount of time
 - Initially used ground control in 2 pilot states
 - 2006 Utah
 - 2007 Arizona
 - 2008 IN, MN, NH, NC, TX, VT, VA
 - 2009 to present - All NAIP states done using GCPs

NAIP Ground Control Points

- Ground control used for inspecting the horizontal accuracy of the NAIP imagery
- Most GCPs are on manmade, permanent features. Maintained targets, vegetation, or other temporary or semi-permanent features can also be used.
- Basic Requirements
 - Photo identifiable on 1-meter imagery
 - Accuracy of 30-cm or better, accept up to 1-m
 - Support info (description, photos, sketches, ...)

NAIP Ground Control Points

- “95% of well-defined points tested shall fall within 6 meters of true ground”
- Since 2010 the most recent available NAIP imagery for each CONUS state has been created & inspected using ground control
- Over 38,000 points and growing

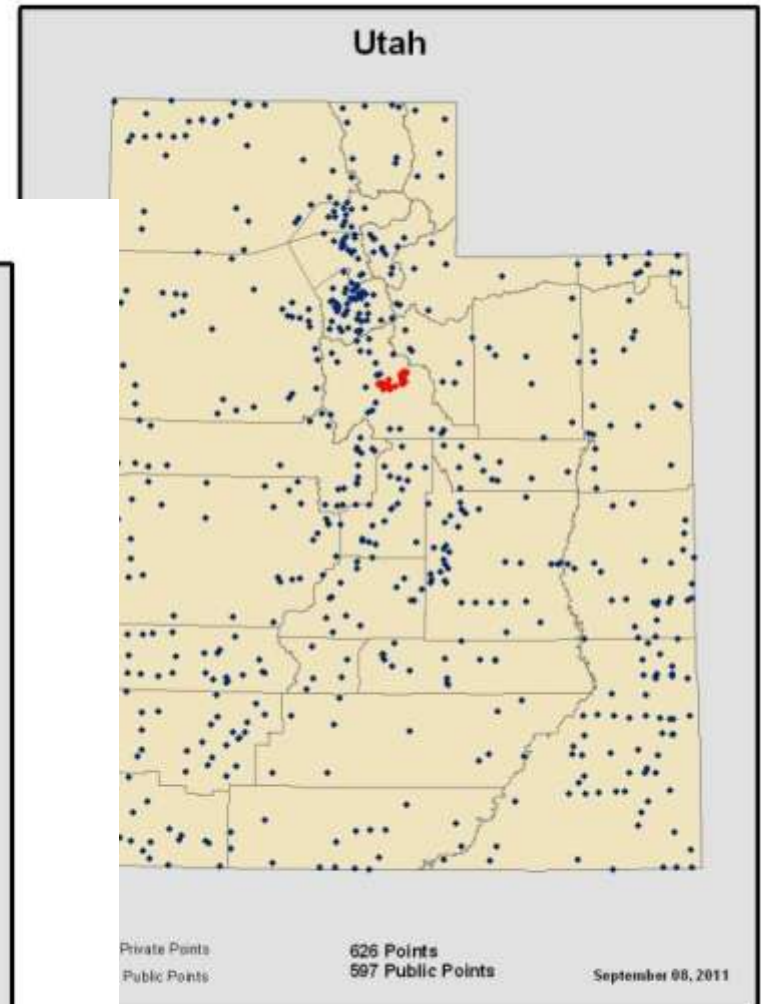
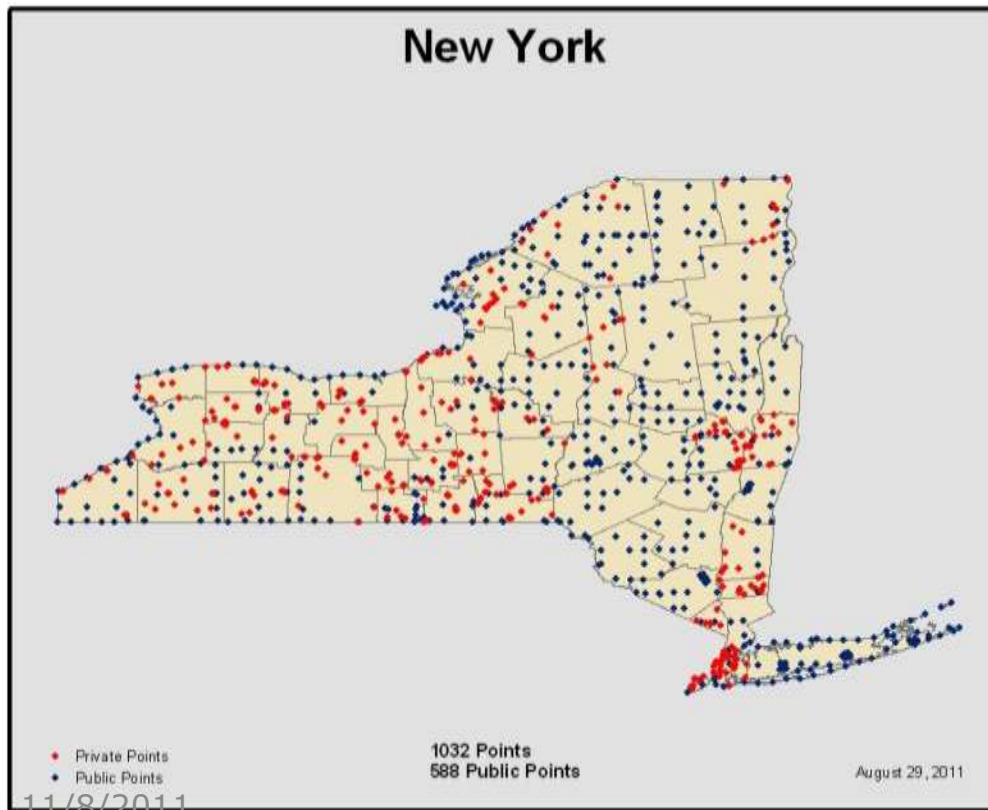
NAIP Control Point Coordination

- APFO coordination done on a state level basis
- GCPs received from many federal, state, tribal, & local government agencies and organizations
- Coordination with IADIWG, NDOP, Federal, State, Tribal, Local, ...
- NAIP GCP Coordination Contacts
 - Zack AR, CT, DE, DC, FL, GA, IA, ID, IN, KS, MA, MD, MO, MS, MT, NE, NH, NM, OH, OK, OR, RI, VA, VT, WI, WY
 - David AL, AZ, CA, CO, IL, KY, LA, ME, MI, MN, NC, ND, NJ, NV, NY, PA, SC, SD, TN, TX, UT, WA, WV
 - Also gathering GCPs for AK, HI, Pacific Basin, PR, and USVI

NAIP Control Point Coordination

- Potential data from NGA, Census, others
- GCPs provided to several federal agencies
- GCP coverage is examined to determine areas that lack GCPs or that could benefit from improved data
- Coordination is ongoing for each state, whether or not a particular state is currently scheduled for imagery acquisition. Several states provide new GCPs on a regular basis as part of their state imagery programs.

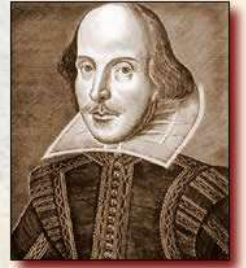
NAIP GCP Coverage Examples



GCP Types

- Target vs. Permanent Features
 - Painted and temporary target (target size and shape)
 - Short term or long term use and maintenance
 - Maintaining targets
 - Suitable permanent features
 - Parking lot corners, driveways, sidewalks, intersections, cattle guards, concrete pads, “lone bush”, crosswalk, ...
 - Viewable on 1-m compared to ½-m, 1-ft, etc
 - Painted stripes and other smaller features plus all of the items listed above for 1-meter
 - Database attribute for GSD suitability (1-m, hi-res, etc)

To share or not to share?



- Sharing points
 - Inter/ intra-agency, government only
- Ask and document if the data can be shared
 - GCPs labeled as “not shareable” will not be shared, even with government partners.
- Not publicly available
 - GCP locations not known by vendors
 - If sufficient GCPs are available for a particular state or area, this policy could possibly change in the future

Coordination Opportunities and Challenges

- Current coordination
 - FSA, USGS, NOAA, FS, other federal, state, tribal, county, city, ...
 - IADIWG (past), NDOP, NSGIC, state organizations
- Potential coordination
 - IADIWG, NDOP, FGDC Cadastral, Census, others
- Identifying when and where new or replacement GCP data may be needed

Database Background

- Migration to ORACLE database storage in 2008
 - Points and all supplemental data
 - .jpgs, OPUS reports, written descriptions, etc.
 - Several fields for each point
 - Point data and supplemental data are formatted and an automated process loads the data into ORACLE
 - Reporting capability, data is more secure
 - As the Database grows having the data in ORACLE is a benefit
 - 2008 – 7,302
 - 2009 – 31,055
 - 2010 – 37,902
 - 2011 – 38,618

Column Name	Data Type	Nullable	Data Default
ABCONTROLPT_ID	NUMBER(6,0)	No	(null)
APFO_ID	VARCHAR2(30 CHAR)	No	(null)
POINT_ID1	VARCHAR2(50 CHAR)	Yes	(null)
POINT_ID2	VARCHAR2(50 CHAR)	Yes	(null)
LAT_DD	NUMBER(19,15)	No	(null)
LON_DD	NUMBER(19,15)	No	(null)
ACCURACY	VARCHAR2(30 CHAR)	No	(null)
FIPS_CODE	VARCHAR2(5 CHAR)	No	(null)
FIPS_STATE	VARCHAR2(2 CHAR)	No	(null)
ABCPT_DESC	VARCHAR2(50 CHAR)	No	(null)
MON_FLAG	VARCHAR2(1 CHAR)	Yes	(null)
PUBLIC_FLAG	VARCHAR2(1 CHAR)	Yes	(null)
COL_DATE	DATE	Yes	(null)
ADD_DATE	DATE	No	(null)
OBS_DATE	DATE	Yes	(null)
UTM_ZONE	VARCHAR2(6 CHAR)	No	(null)
POS_DATUM	VARCHAR2(8 CHAR)	No	(null)
ELEV_DATUM	VARCHAR2(10 CHAR)	Yes	(null)
E_ELEV	NUMBER(11,6)	Yes	(null)
O_ELEV	NUMBER(11,6)	Yes	(null)
AT_YEAR	NUMBER(4,0)	Yes	(null)
LOW_RES	VARCHAR2(30 CHAR)	Yes	(null)
DATA_SRCE	VARCHAR2(50 CHAR)	Yes	(null)
CNTCT_NAME	VARCHAR2(50 CHAR)	Yes	(null)
CNTCT_PHONE	VARCHAR2(30 CHAR)	Yes	(null)
CNTCT_EMAIL	VARCHAR2(50 CHAR)	Yes	(null)

Purpose and Use

- Primary purpose of the control point database
 - A resource to be used as source data in an inspection application such that imagery can be inspected to true ground.
 - This resource has been used to inspect NAIP and Resource imagery

Purpose and Use (cont.)

- Business Rules for the database
 - All states receiving NAIP in 2010 will use the absolute accuracy specification, provided resources are available.
 - Once a state moves to the absolute accuracy specification, it will not revert back to a relative accuracy specification in subsequent years.
 - Control point projects will be broken down and managed on a state by state basis, designating a project item area.
 - Control will only be obtained for use as QA checkpoints, not as Government Furnished Material (GFM).
 - The control point database is currently private and will not be released to the public or to vendors without prior approval. Data within the database marked “No” in the “Public” field will not be distributed outside of APFO. Approval authority to distribute this data currently resides with the Geospatial Services Branch Chief.
 - Internal/external requests for control point data extracts, including supplemental data for custom analysis will require a written request to GSB – SCSS stating what data is required and the purpose or intended use of the data. GSB – SCSS will determine access, data format and security measures for the requested control point data that is requested.

Purpose and Use (cont.)

- Roles at APFO
 - Geospatial Services Branch
 - Manage all aspects of obtaining control point data
 - Review for usability and format any new or existing control point data prior to the data being loaded into the control point database
 - Load, update, maintain, or obsolete control point data within the database
 - Determine impacts horizontal velocity may have on control points in the database

Purpose and Use (cont.)

- Roles at APFO
 - Technology Services Branch
 - Ensure control point and supplemental data is stored in the database so that it is stable, supported, backed-up, and retrievable by the GSB for updating and maintenance, and by the Quality Assurance Branch (QA) for the inspection process for usability and format any new or existing control point data prior to the data being loaded into the control point database
 - Implement QA inspection process and associated applications
 - Provide full access to the designated GSB representative so that he/she can load, update, maintain, or obsolete the control point data

Purpose and Use (cont.)

- Roles at APFO
 - Quality Assurance Branch
 - Inspect the horizontal aspect of NAIP imagery using the inspection application
 - Notify geospatial services branch when absolute control imagery inspection is complete so the annual database maintenance process can begin

Current Status

- 38,618 Points as of 12/2011
- Size of database – 5888 MB but table space is set to auto extend up to 20000 MB
 - Control Point Sources
 - Federal
 - USGS, USFS, NGS, NOAA
 - Non-federal
 - NAIP states, private industry, local governments
 - 73% of database is from a federal source
 - Most points provided to APFO for free
- >10 Million Dollars estimated value if purchased from a commercial vendor

Data Sources

- Largest Contributors of Points
 - USGS (23705)
 - Texas (1725)
 - USFS (1721)
 - NOAA (1475)
 - AR GIO (1371)
 - NC State (942)
 - NV DOT (604)
 - OHOIT (509)
 - MN State (436)
 - NE NRCS (410)

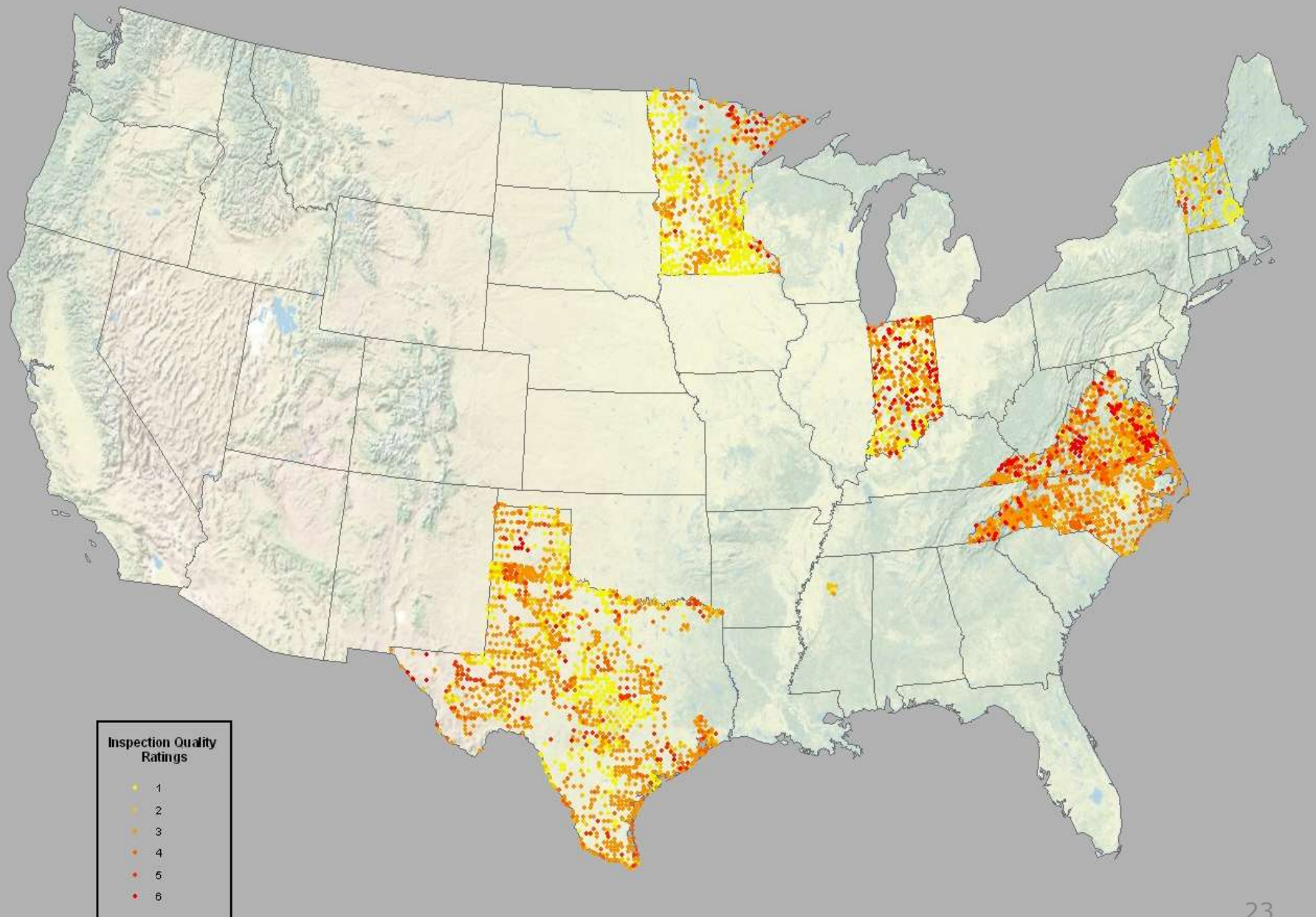
Database Quality

- Inspectors determine the quality of points not the imagery by using a rating scale from 1-6.
- A rating of 1-very good quality, 3-average, 6-considered for deletion
- Part of the maintenance of the database is checking all the 4,5, and 6 rated points to determine if the points remain in the database or are no longer usable
- Most common reasons points are deleted:
 - Point no longer exists on later imagery due to area change
 - Point becomes obscured by vegetation on most years
 - Description is inaccurate, source unavailable to update

Database Quality (cont)

- Inspection 2008
 - 5394 total points inspected
 - Ratings
 - 1 – 19%
 - 2 – 19%
 - 3 – 44%
 - 4 – 9%
 - 5 – 5%
 - 6 – 4%

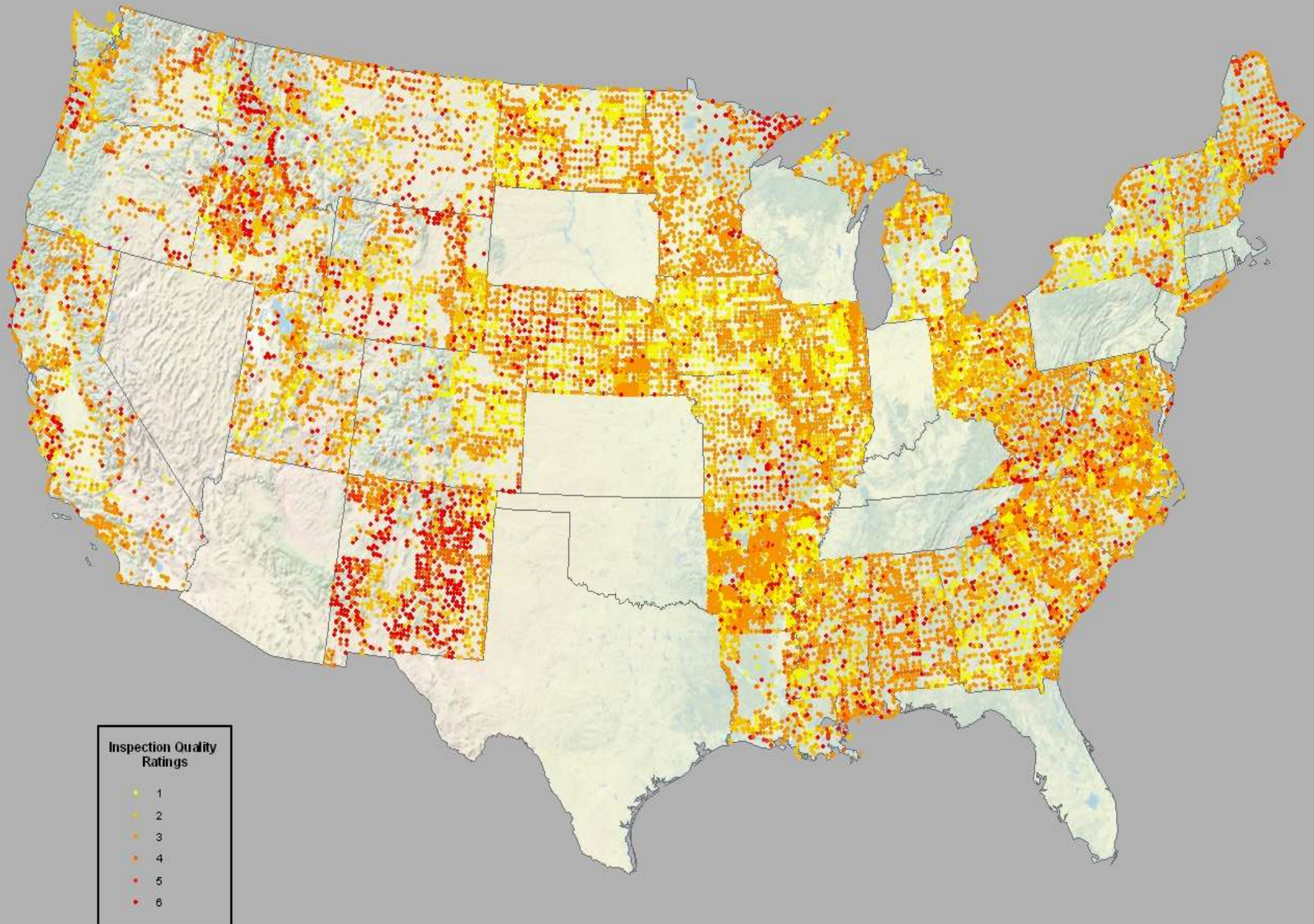
2008 Inspection Quality Ratings



Database Quality (cont)

- Inspection 2009
 - 22496 total points inspected
 - Ratings
 - 1 – 14%
 - 2 – 25%
 - 3 – 45%
 - 4 – 5%
 - 5 – 3%
 - 6 – 8%

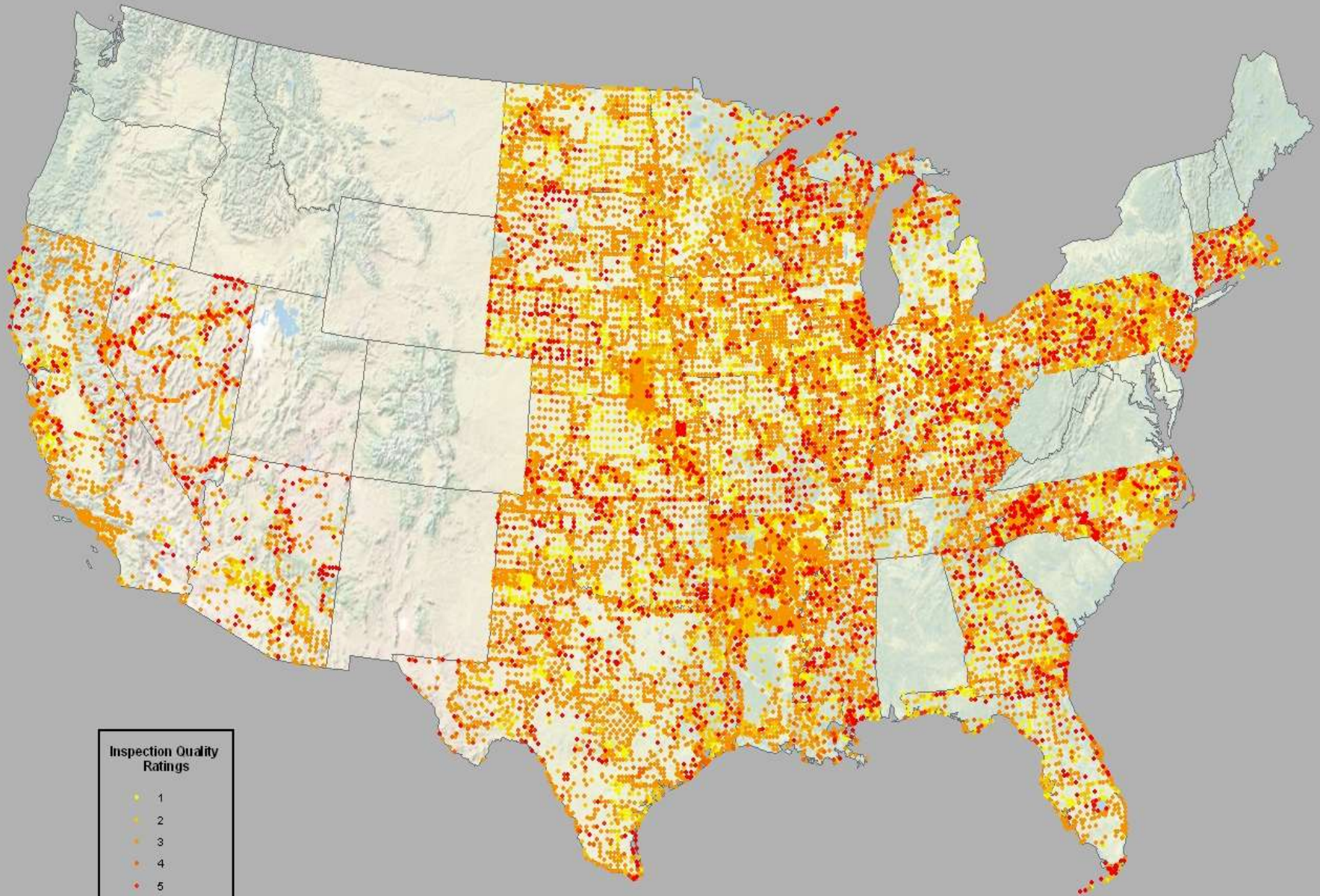
2009 Inspection Quality Ratings



Database Quality (cont)

- Inspection 2010
 - 25248 total points inspected
 - Ratings
 - 1 – 12%
 - 2 – 21%
 - 3 – 51%
 - 4 – 4%
 - 5 – 3%
 - 6 – 9%

2010 Inspection Quality Ratings



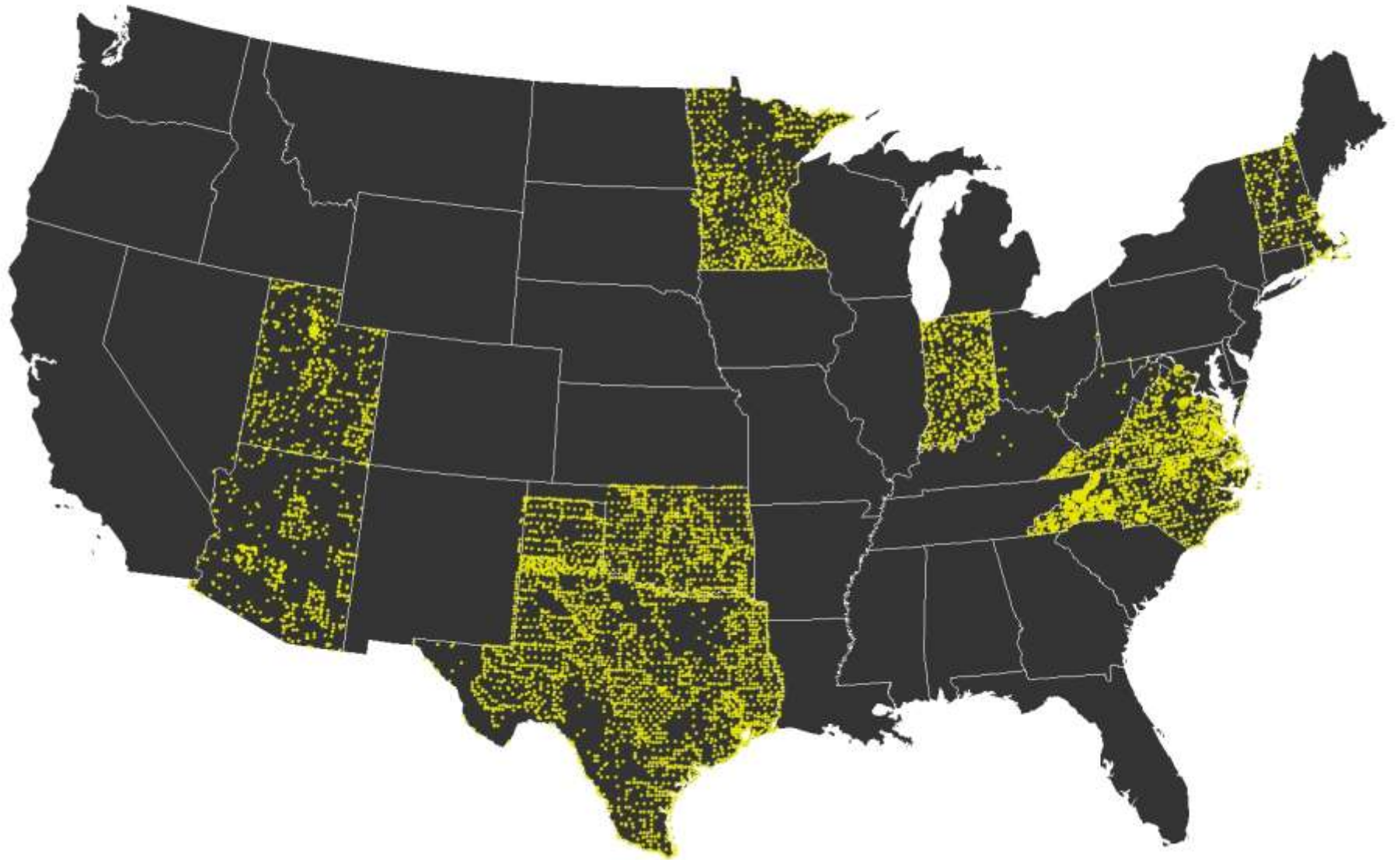
Inspection Quality Ratings

- 1
- 2
- 3
- 4
- 5
- 6

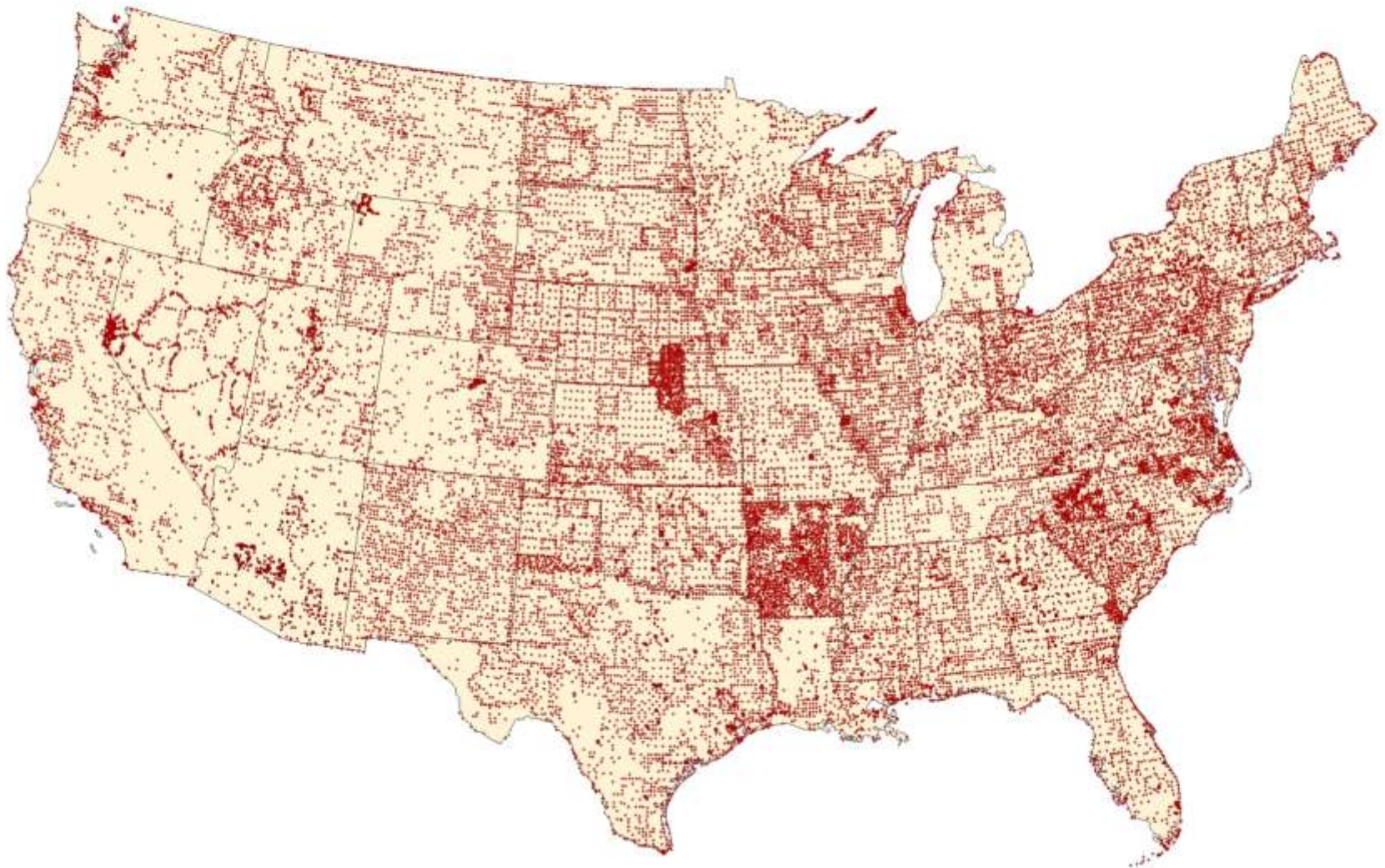
Database Extractions

- This year large pull done for USGS
- Previously extracts are a time consuming manual process
- Automated tool created to pull points supplemental data and create a directory structure for the customer
- This process illustrated some problems with the database and allowed the opportunity to correct and improve the database
 - Over a thousand points misnamed
 - Supplemental data was listed for point but was not loaded
 - Point had incorrect supplemental data
 - Point listed as having supplemental data but none was available

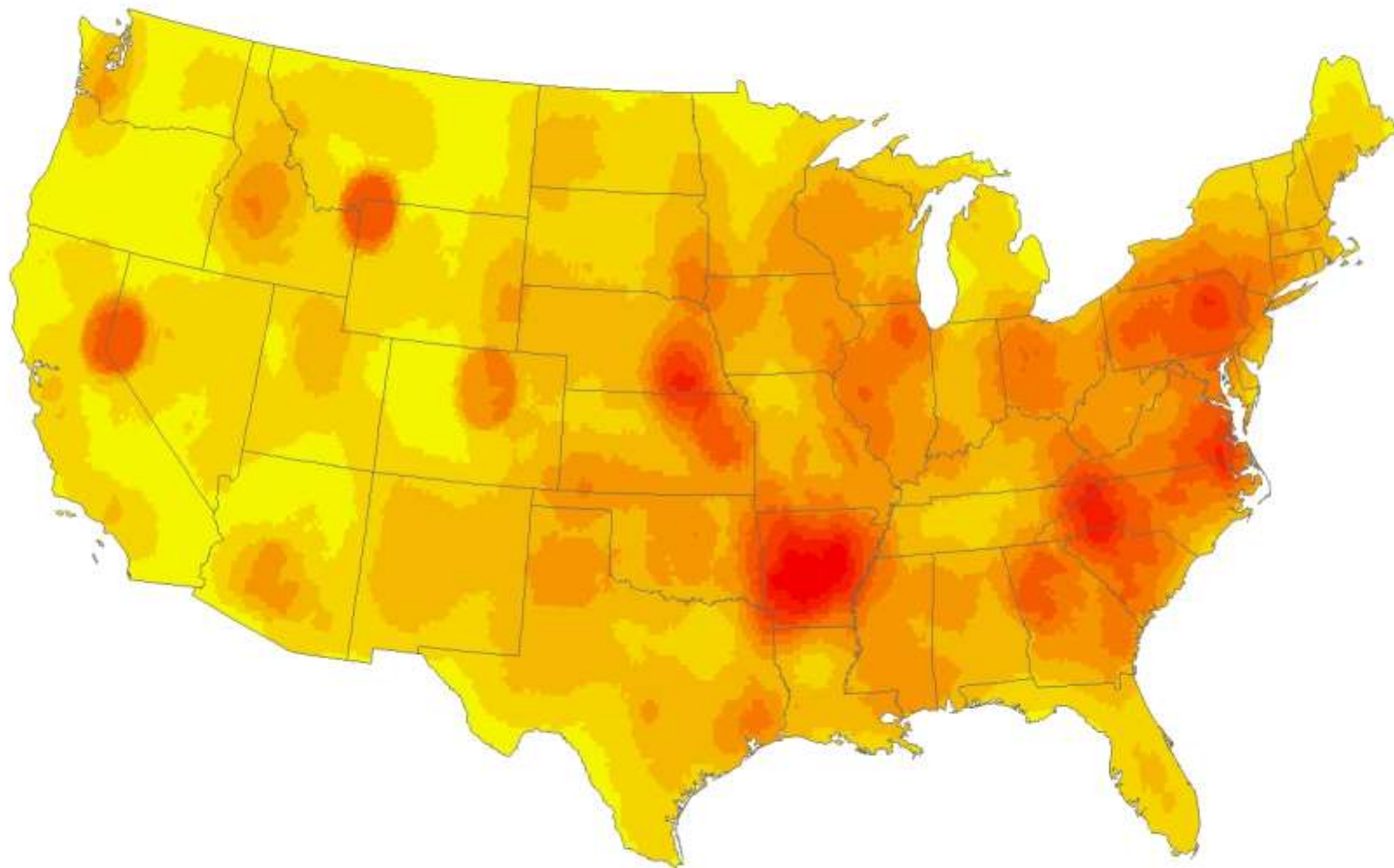
2008



2011 Control Point Locations



2011 Control Point Density

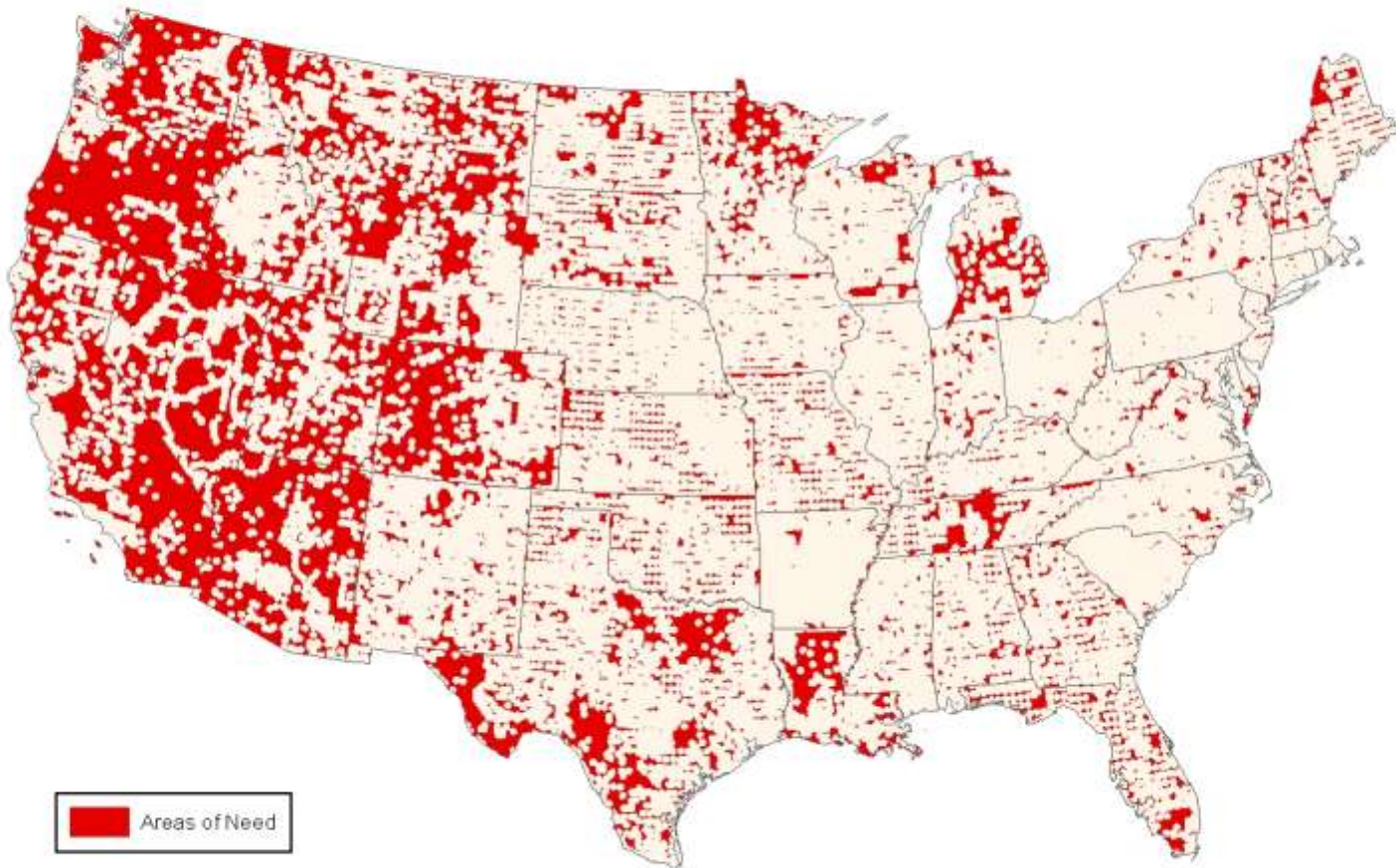


Less Dense

More Dense

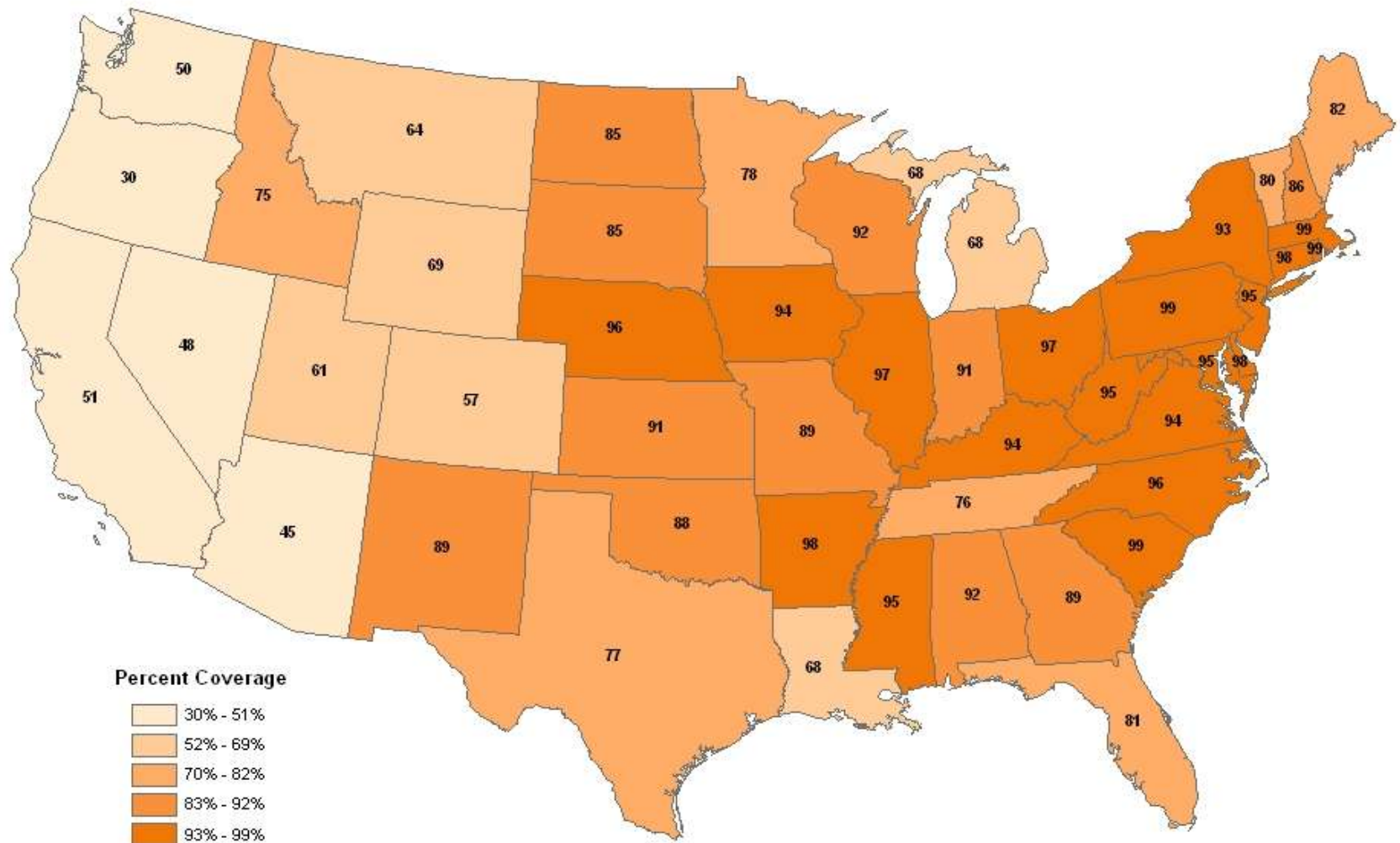


Areas of Control Point Need



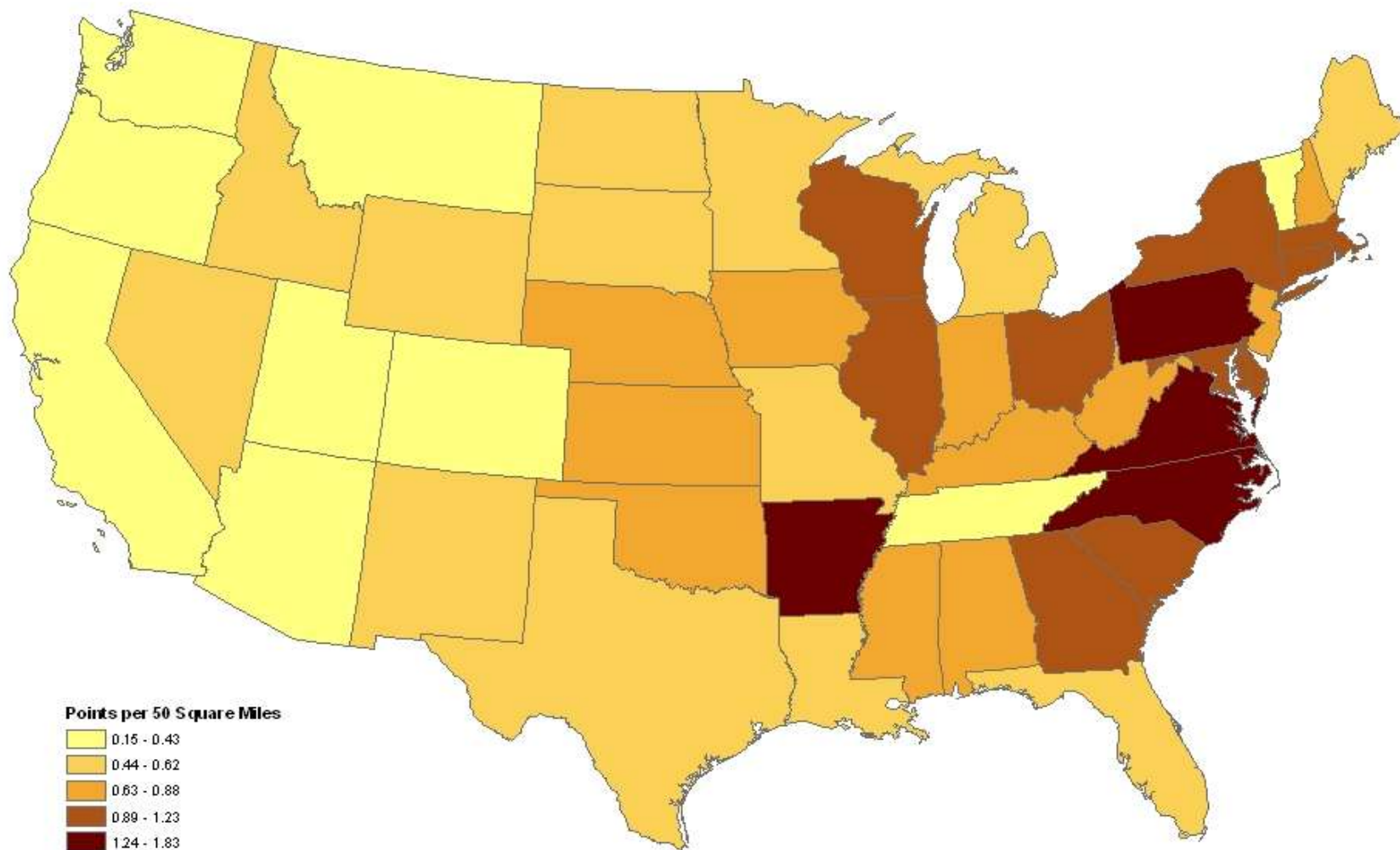
Buffer zone used to create this map is 8 meters

Percent of State with Control Point Coverage



Buffer zone used to create this map is 8 meters

Points per 50 Square Miles by State



Future Plans

- Continue to add control to the database
 - Search for data sources through research, teaming/partnering, etc.
- Continue to use database to facilitate the horizontal accuracy inspection of NAIP imagery
- Continue to review and inspect points and maintain the database in general
- Focus on areas where control points are needed
- Use the database to inspect imagery from other acquisition programs

Further Information

- Documentation
 - [Control Point Requirements](#)
 - [Overview of how the database is used](#)
- Contacts
 - Control point acquisition
 - David Davis: david.davis@slc.usda.gov, (801)844-2933
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 - Control point database applications
 - Margaret Nakagiri: margaret.nakagiri@slc.usda.gov, (801)844-2972
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